**FAMU - FSU** COLLEGE OF ENGINEERING

Senior Design Team 304

*Professors:* Dr. Chuy & Dr.McConomy

Restated Project Charter

*Authors:*

Sam Hammermaster

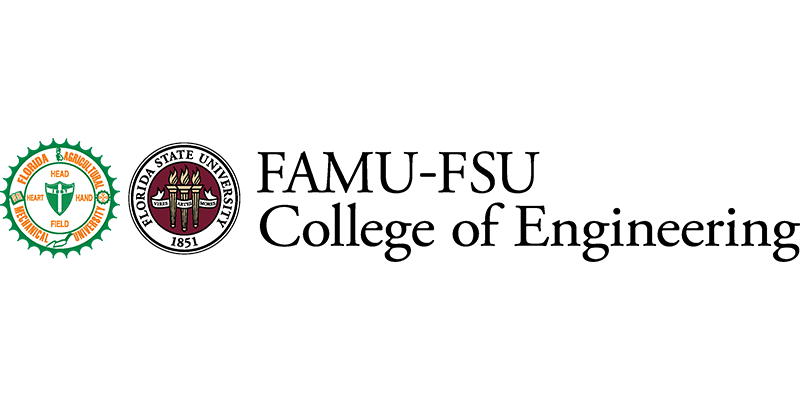
Gage Irwin

Kent Logue

Erin Murphy

Jordan Wilkerson

January 18th, 2022

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**Project Scope**

**Project Description**

Develop a hardware beacon that visually indicates faulted FPL pad mounted equipment. Then collect and generate an image library and train a corresponding image recognition system to detect and locate the beacons from autonomous drone footage.

**Key Goals**

* Accurately indicate faulted equipment from a distance of up to 50 feet and in various environmental conditions.
* Securely mount beacon to the pad-mounted equipment.
* Develop a real-time image recognition system to locate beacons

**Markets**

* Florida Power and Light employees
* NextEra Energy, Inc. employees
* Power Delivery Companies
* UAV Companies

**Assumptions**

* Hardware
  + Assume that the hardware beacon solution is connected to a fault current indicator that will deliver power to the device if a fault has occurred and the beacon should be on.
  + The team will compile a library of images of the hardware beacon for the image recognition portion of the project
  + Team will construct mock pad mount transformer(s) for the purpose of image collection
  + Real world conditions may present this equipment near/under vegetation, surrounded on three sides by fences or partially buried under grade
    - Transformers also range in condition, size, and color
  + The transformer will provide power to the device
* Software
  + UAVs and UGVs would be Autonomous Drones, Cars, Quadrupeds and Rovers that are dispatched to respond to the outages
    - For UAVs, the angle of approach will vary but the drone will have a Lat/Long of the equipment, accurate to within a few feet (Assume +/- 10’ radius)
    - The cameras on these vehicles are outfitted with both standard HD cameras as well as FLIR Thermal Cameras
  + Vehicles will be recording video in real time. Team can implement image recognition solution with either constant video feed or static images and is not responsible for the collection of this footage as part of the design.
  + Vehicle will be given a path to be flown/driven with a set number of devices (With Lat/Long) to check
    - Output of Image Recognition will be to confirm that:
      * Each pad mount device is successfully located and identified (Y/N)
      * For each device successfully identified – was the beacon on or off?
    - Assume internal system logic within FPL team will interpret these results to determine where the crew needs to be sent (Reference underground switching example for additional supporting information)

**Stakeholders**

* Florida Power and Light - Power Delivery Operations
* Dr. Roberts - Advisor
* Dr. Chuy and Dr. McConomy – Professors
* NextEra Energy – Parent Company

**Mission Statement**

Team 304 is committed to developing an innovative solution for fault detection in underground pad mounted equipment. All team members will guarantee a quality senior design experience for each other by acting with integrity, respect, and cooperation. Each member will contribute equal effort while empowering one another to deliver great work, thereby ensuring the project positively reflects the FAMU-FSU College of Engineering and Florida Power and Light.

**Roles**

**Software Integration Engineer:** Sam Hammermaster

Responsible for the software implementation as it connects to the hardware involved. The software integration engineer will have at least a baseline understanding of the hardware and software to connect the two sides of the project and act as the liaison for communicating needs between the team and the customer. The software integration engineer will also have secondary responsibility to help facilitate internal meetings as well as meetings outside of the team. Finally, the software integration engineer will be responsible for leading, creating, and maintaining the project website.

**Computer Vision Engineer:** Gage Irwin

Responsible for implementation and research of computer vision techniques for identifying objects in a scene. Computer vision engineer will be knowledgeable with programming and computer vision techniques. Able to identify strengths and weaknesses of using computer vision to accomplish our tasks. A secondary task of computer vision engineer will be cleaning, optimizing, and maintaining implemented code by other team members. This will involve making sure code is clearly understandable, commented, and free of obvious flaws.

**Mechanical Design Engineer:** Kent Logue

Responsible for the mechanical design portion of the project. Relays information to the project manager regarding design. Should be knowledgeable on details about the design for the project. Able to supply the team with relevant information when making decisions about design.

**Project Manager:** Erin Murphy

Manages communication across the team: develops a project timeline, delegates tasks, finalizes documents, and helps other positions when needed. Responsible for promoting teamwork and keeping communication flowing between the team and sponsor. Organizes, plans, and sets up meetings while ensuring proper documentation and meeting minutes. Finally, facilitates presentations by individual team members and assists with overall progress.

**Mechatronic Design Engineer:** Jordan Wilkerson

Responsible for the mechanical design, material selection, and implementation of hardware. Creates CAD models and is responsible for rapid prototyping of hardware design ideas. Maintains contact with software design engineers as well as the project manager to facilitate communication and submits documentation, designs, and purchase orders for approval.

**All Team Members:**

* Communicates honestly and often
* Takes ownership of individual work
* Acts punctual and professional
* Supports other team members in their roles when needed
* Goes above and beyond responsibilities to ensure work is being done well and on time
* Will keep a positive attitude and operate with integrity
* Communicate effectively and often
* Buys into the project goals and success
* Respects others roles and ideas
* Are respectful to advisor and sponsor

**Communication**

The team utilizes text messaging, email, and basecamp. The main form of communication on a day to day basis is text messaging. For important information and correspondence with our sponsor and advisor we use our school email. We will use basecamp to contact the TA’s and our functional manager.

Each team member must check their email at least two times a day in order to stay in constant contact. All team members should acknowledge text messages as soon as possible. If a situation arises that a team member is not able to communicate for an extended period, he or she should inform the team ahead of time. Schedules on Outlook email should be kept up to date so that each team member is aware of meeting times that work for everyone.

Documents will be shared and signed on Docusign, via our FSU/FAMU accounts. This ensures that it is easy to share documents with our advisor and anyone at FPL. All current and completed documents should be put in a shared Google Drive folder so that everyone has access to all of the information. While submitting documents for senior design assignments, one should also add them to the Google Drive folder.

**Attendance Policy**

If a meeting must be canceled, an email and text message must be sent to the group at least 24 hours in advance. Any team member that cannot attend a meeting must give advance notice of 24 hours informing the group of his absence. Reason for absence will be appreciated but not required if personal. Repeated absences (more than 2) without proper notification of excuse will be punishable by possible charitable donation to the team via pizza if voted for by the other members of the group. Continued absences by the same team member will enact the conflict resolution process outlined below.

**Team Dynamics**

The students will work as one cohesive unit. While each member has their own responsibilities within the team, they will be expected to pitch in and offer any form of help requested in order to submit the greatest quality of work in the most efficient timeline. If one team member feels like they are completing more than their share of work, they should bring that up to other team members in a respectful way that does not point fingers. Refer to the conflict resolution for any conflict that might arise in this case. Team members will be honest with the work they are completing. During meetings, all team members have an equal right to share information and opinions. Everything done is for the benefit of the project and together everyone achieves more.

**Ethics**

Team members are required to be familiar with the NSPE Engineering Code of ethics as they are responsible for their obligations to the public, the client, the employer, and the profession. There will be stringent following of the NSPE Engineering Code of Ethics.

**Dress Code**

Team meetings will be held in casual clothing. Any meeting with the advisor or sponsor to the team should have a business casual dress code. Any meeting where a presentation is taking place will have a business professional dress code. Failure to follow the dress code in two or more meetings will result in talking to the project advisor about further action.

**Weekly and Biweekly Tasks**

Team members will participate in all meetings with the sponsor, adviser and instructor. During said times ideas, project progress, budget, conflicts, timelines and due dates will be discussed. In addition, tasks will be delegated to team members during these meetings. Repeat absences will not be tolerated. Meetings can also occur virtually to allow for flexibility. The same rules apply to virtual meetings.

**Decision Making**

It is conducted by consensus and majority of the team members. Should ethical/moral reasons be cited for dissenting reasons, then the ethics/morals shall be evaluated as a group and the majority will decide on the plan of action. Individuals with conflicts of interest should not participate in decision-making processes but do not need to announce said conflict. It is up to each individual to act ethically and for the interests of the group and the goals of the project. Achieving the goal of the project will be the top priority for each group member. Below are the steps to be followed for each decision-making process:

* Problem Definition – Define the problem and understand it. Discuss among the

group.

* Tentative Solutions – Brainstorms possible solutions. Discuss among group most plausible.
* Data/History Gathering and Analyses – Gather necessary data required for implementing Tentative Solution. Re-evaluate Tentative Solution for plausibility and effectiveness.
* Design – Design the Tentative Solution product and construct it. Re-evaluate for plausibility and effectiveness.
* Test and Simulation/Observation – Test design for Tentative Solution and gather data. Re-evaluate for plausibility and effectiveness.
* Final Evaluation – Evaluate the testing phase and determine its level of success. Decide if design can be improved and if time/budget allows for it.

**Conflict Resolution**

In the event of discord amongst team members the following steps shall be respectfully employed:

* Communication of points of interest from both parties which may include demonstration of active listening by both parties through paraphrasing or other tools acknowledging clear understanding.
* Administration of a vote, if needed, favoring majority rule.
* Team advisor will facilitate the resolution of conflicts.
* When conflict resolution does not work or one party feels they were unfairly treated in said conflict resolution, they may request a “retrial” where they will face off against the other party in a game of competitive Rock-Paper-Scissors (best 2 out of 3). The project advisor will accept or deny the Rock-Paper-Scissors request.

Table

Description automatically generated